Eccel Technology Ltd
Embedded RFID made simple

RWD SMT Baseboard User Manual

v1.1

Table of contents

Preface

This document describes the performance and other technical characteristics of the RWD-QT SMT baseboard. The content is as follows:

Chapter 1. Introduction – an overview of the board and a description of its operation.

Chapter 2. Electrical characteristics – describes the electrical characteristics of the RWD-QT-SMT baseboard.

Chapter 3. Installation and operation – describes how to configure and get started using the RWD baseboard.

Chapter 4. Application notes – additional useful information.

Appendix A. “Schematics and Layouts” – the schematic and layout diagrams of the board.

Appendix B. “Bill of Materials (BOM)” – lists the parts used to build the board.

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1 Introduction

1.1 General description

The RWD SMT baseboard is a demonstration, evaluation and development board for the RWD-QT-SMT module. It is a complete reader and tag acceptance solution for passive RF transponders. The solution only needs a 5V DC supply to be a fully featured read/write system. The RWD module provides internal EEPROM memory for holding a list of authorised identity codes and system configuration parameters, a manual override switch facility and has LED drives to give visual indication of acceptance. The RWD also has a serial UART interface that allows a host system to communicate it as the user requires, so that system features can be customised, configurations changed and tag read/write data handled by a host system.

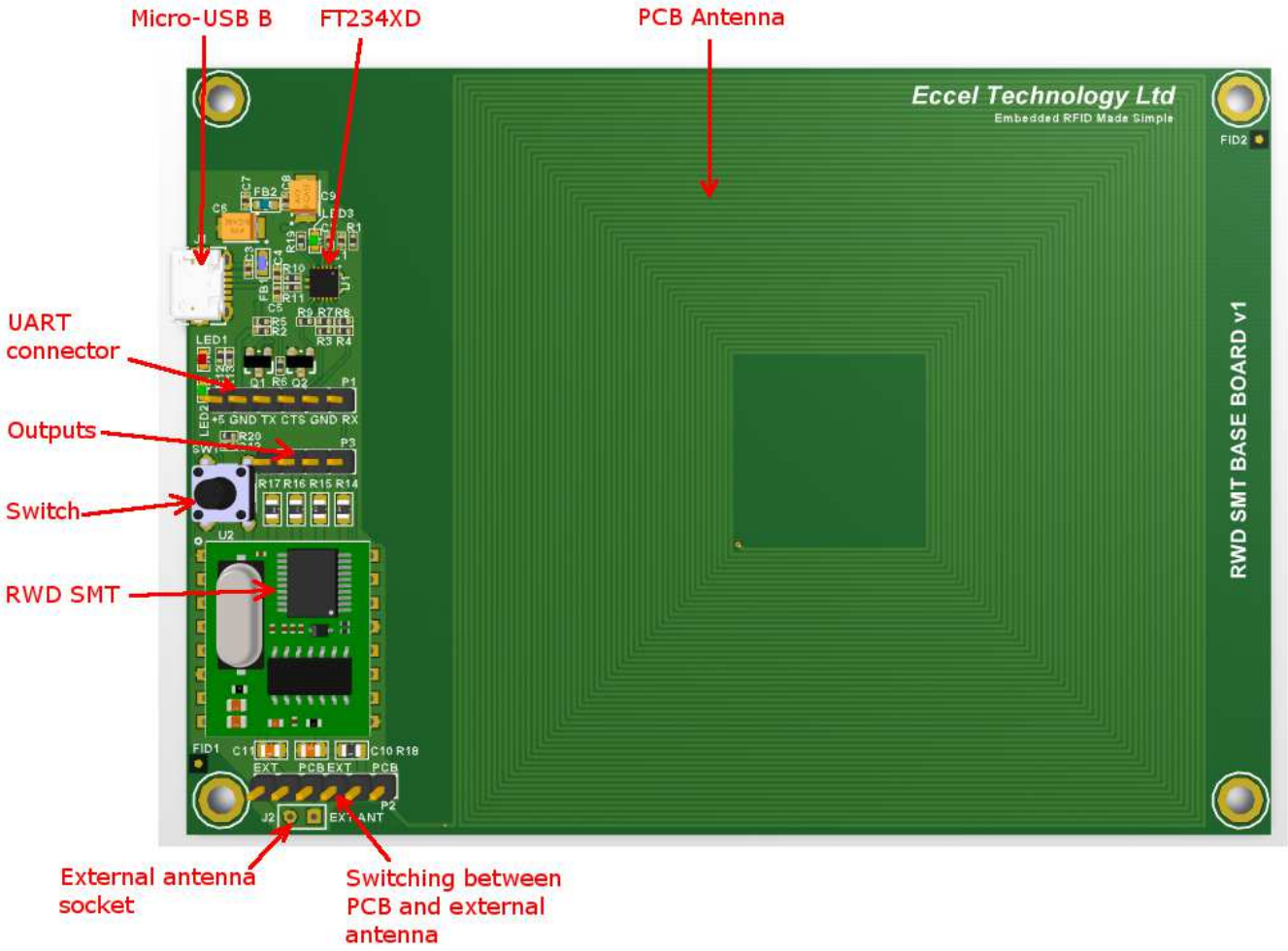
The RWD SMT Baseboard allows the user to communicate through a USB interface to a PC. The board can be connected to the USB port of a PC with a FTDI VCP (Virtual Com Port) driver installed, allowing the Windows applications to communicate with the reader module via the allocated COM port. The RWD SMT Baseboard uses the FTDI (Future Technology Devices International Ltd) FT234XD serial-to-USB converter chip. The appropriate VCP USB driver should be downloaded and installed form: http://www.ftdichip.com/Drivers/VCP.htm.

1.2 Features

Parameter	Typical Value
Range (dependent on antenna dimensions and tuning, tag: Hitag 2 ISO card) a) PCB antenna b) External antenna (coil 1,5 cm) c) External antenna (coil 7 cm)	 up to 9 cm up to 5 cm up to 9 cm
Nominal RF frequency	125 kHz
Maximum data rate (between Tag and RWD)	4k baud
Communication time for Tag authentication	Less than 100 ms (Hitag 2)
Auxiliary output drive current	up to 25 mA
Switch input (pulled up)	active low
Serial interface	TTL level serial (9600 baud, 8-bits, 1-stop, no-parity, Tx, Rx and CTS)
Supported tags	Hitag 1/S, Hitag 2, (EM) H400X/4102, MCRF200/123
Width x Length	116 x 82 mm

Table 1.

1.3 Product overview



Note: Mounting hole spacing: 109 x 75 mm. Hole size is 3.2 mm.

1.4 Outputs and headers

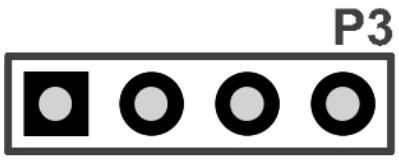
The RWD SMT baseboard has link options to allow selection between the on-board 125 kHz PCB antenna or the external 125 kHz antenna coil. The P1 UART connector allows the user a simple connection to an embedded system for evaluation and prototyping. The P3 connector allows the user to connect 4 outputs to the board. Each of them can support a maximum of 25mA.

P2. Antenna selection header – external antenna

P2. Antenna selection header – PCB Antenna

J2 – external antenna socket

P1 – UART connector
P1.1 – RX
P1.2 – GND
P1.3 – CTS
P1.4 – TX
P1.5 – GND
P1.6 – +5V



P3 – Outputs
P3.1 – RWD SMT OP3
P3.2 – RWD SMT OP2
P3.3 – RWD SMT OP1
P3.4 – RWD SMT OP0

Note: Square pad is always pin number 1.

2 Electrical Characteristics

2.1 Test conditions

Typical device parameters have been measured at ambient temperature 22°C ± 3°C and using a power supply of 5V ± 10%.

2.2 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit	Notes
T_S	Storage Temperature	-40	+85	°C	
V_{DDMAX}	Supply Voltage	-	5.5	V	
I_{IOMAX}	Output Pin Current	-	25	mA	

Table 2.

2.3 Operating Conditions

Symbol	Parameter	Min	Max	Unit	Notes
T_O	Operating Temperature	-40	+85	°C	
V_{DD}	Supply Voltage	4.5	5.5	V	5V via USB bus
I_{AVE}	Average Current Consumption	7	30	mA	RWD module + LEDs + USB interface (current consumption is dependent upon antenna type)

Table 3.

3 Installation and operation

3.1 Minimum requirements

For USB connectivity, the minimal physical requirement for the PC is a standard USB 2.0 port. The board connects to the PC via the micro-USB connector (J1). It is recommended to connect the board to the PC through a self-powered USB hub.

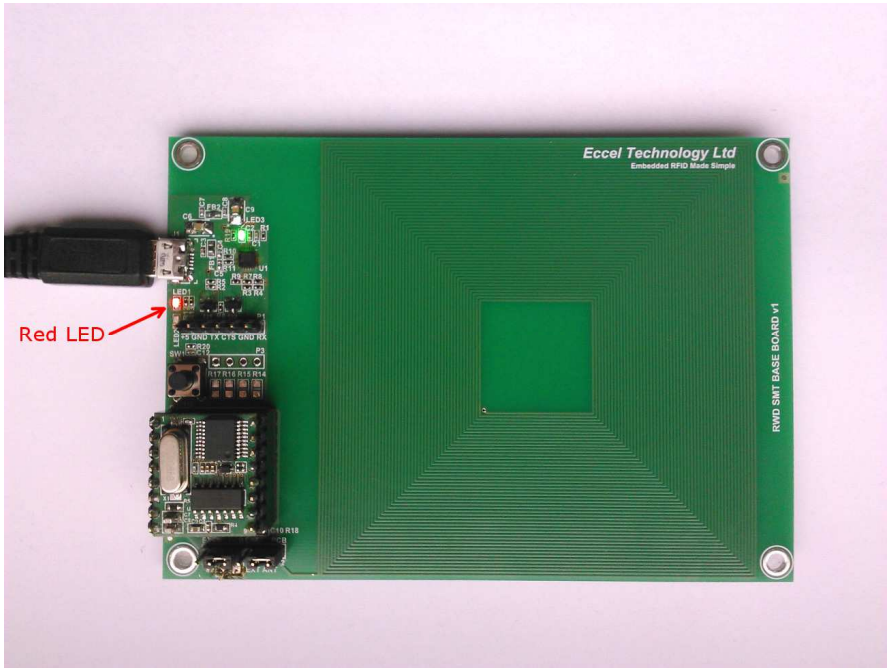
3.2 Operation of the RWD SMT baseboard

Before the RWD SMT baseboard can communicate with a PC over USB, a few steps must be performed. The board uses the FTDI FT234XD Full Speed USB to Basic UART converter chip. FTDI provide VCP (Virtual COM Port) USB drivers for most common Operating Systems including Windows, MAC and Linux. The appropriate VCP USB driver should be downloaded and installed from: http://www.ftdichip.com/Drivers/VCP.htm.
Further information about the FT234XD chip: http://www.ftdichip.com/Products/ICs/FT234XD.html.
ECCEL Technology provide Windows applications and Debug utilities that allow all the features of the RWD module and the card/tag type to be easily evaluated. The *MicroRWD Quad Tag* is a graphical user interface for management of the RWD baseboard. The application is designed to be used in the Microsoft® Windows® environment and provides configuration and full access to tag memory. For evaluation of the RWD-QT-SMT, download and install the (Win32) RWD-QT Windows application
(http://www.ibtechnology.co.uk/Win32/Win32_QT.ZIP).
or
for Windows 7, 64-bit Operating Systems, use the new .NET (Win64) RWD-QT Windows version
(http://www.ibtechnology.co.uk/Win32/MicroRWD_QuadTag-REL-1_0.zip).
Download the .ZIP compressed file, un-zip and run SETUP.exe to install in the usual manner.

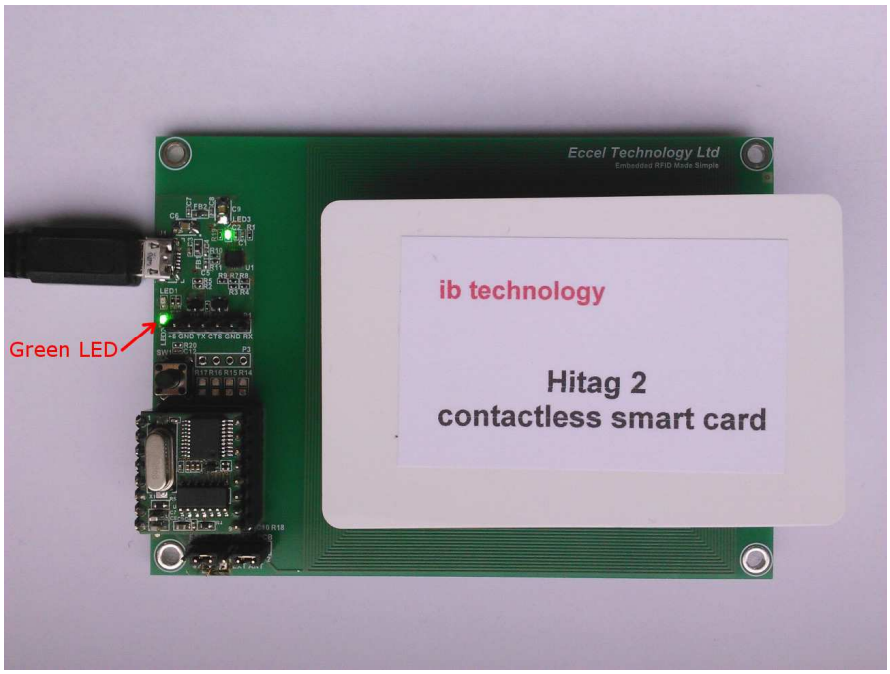
3.3 Getting started

Make sure that the RWD module is properly fitted (see image in section 1.3). Check that the jumpers on the P2 connector are properly set up. It depends upon antenna type – there is one setting for the use of a PCB antenna and another for the use of an external antenna (see section 1.4).

To start using the RWD SMT baseboard, simply connect it to a PC via the micro-USB cable. When power (5V DC) is first applied to the RWD, the red and green LEDs flash once to indicate successful power-up. The device can also check for a broken or shorted antenna and can even detect very badly tuned antennas, these problems are indicated by the red LED flashing continuously until the fault has been rectified. The RWD will normally have the red LED lit until a valid card or tag is brought into the RF field. If the tag is accepted as valid then the green LED is lit and the output drivers (OP0, OP1, OP2, OP3) are switched on. The working baseboard is shown below:



Power supply from USB,
PCB antenna mode,
Hitag 2 mode,
no tag in RF field,
Red LED (LED1) on

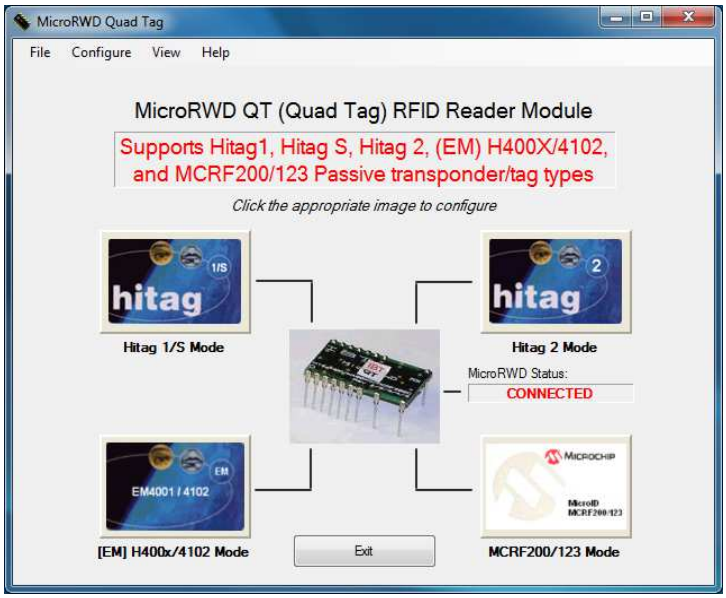


Power supply from USB,
PCB antenna mode,
Hitag 2 mode,
Hitag2 Tag in RF field
Green LED (LED2) on

By default the green LED (LED3) lights when the board is powered but it can pulses when transmitting or receiving data via USB. The Functionality of LED3 can be configured in the internal MTP memory using the software utility *FT_PROG* which can be downloaded from the FTDI Utilities (www.ftdichip.com).

The main window of the *MicroRWD Quad Tag* software is presented below. The RWD SMT baseboard is not connected to a PC and MicroRWD status is: “COM PORT NOT OPEN”.

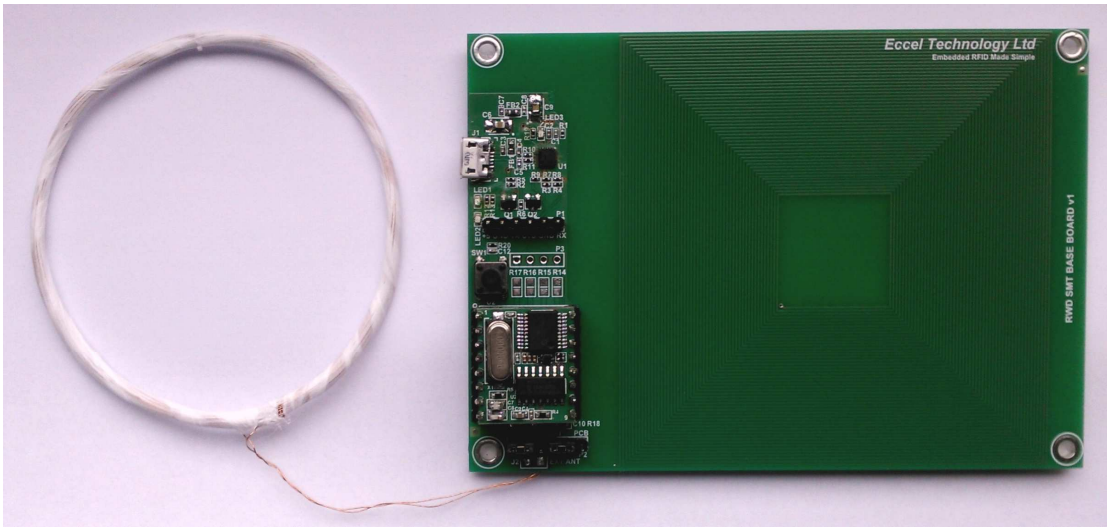
When the baseboard is properly connected to a PC then the MicroRWD status should be: „CONNECTED”. If not, try clicking “Configure” and then “COM port” to select the valid COM port.



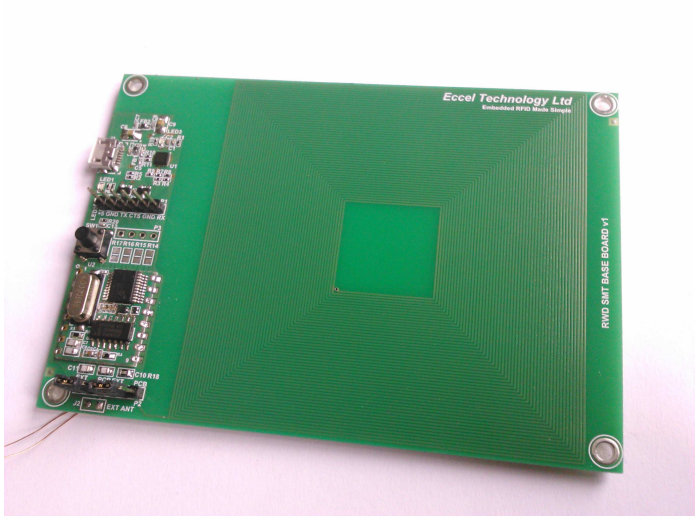
There are 4 main modes: Hitag 1/S, Hitag 2, [EM] H400x/4102 and MCRF200/123. Clicking the appropriate image allows the user to read/write a tag and check tag or RWD status. For further information on the RWD modules click “Help” and then chose “Manual”.

4 Application notes

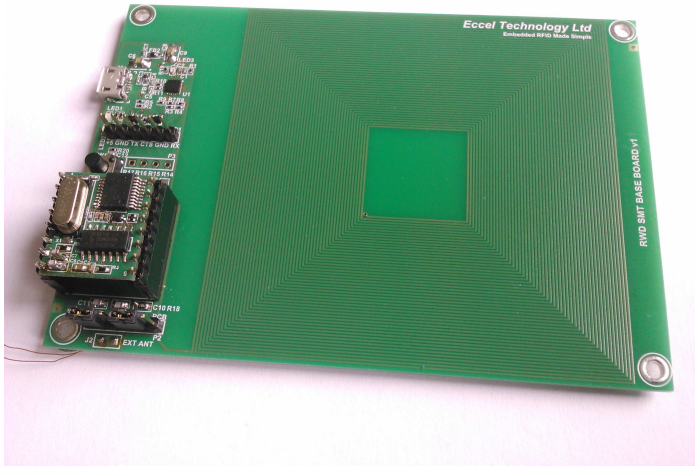
1. An external antenna can be mounted up to 1.5 meters from the RWD SMT baseboard. Screened twisted pair cable should be used with the screen connected to GND. The RWD Baseboard with external antenna coil is shown below. This and other external antennas are available on our website: www.eccel.co.uk.



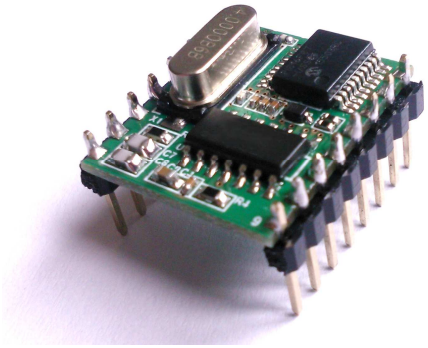
2. External antenna must not be exposed to high voltage ESD sources.
3. If OP0, OP1, OP2 or OP3 output signals are connected off the main system PCB then 1K (minimum) series resistors should be used to protect the RWD SMT from external voltage spikes. Likewise, if the switch override input is taken off the PCB then a series resistor must be used to protect the input.
4. The system will only perform well if the 5V supply is stabilised and noise free. It should be capable of sourcing the maximum current with a good safety margin.
5. We recommend to mount the RWD QT SMT in one of two ways. First is to solder it right to the Baseboard PCB. The second is to use 8-pin headers (see images below). Example headers: female – NINIGI Zl262-8SG, male – CONNFLY ZL201-08G.



The RWD QT SMT soldered right to the Baseboard PCB



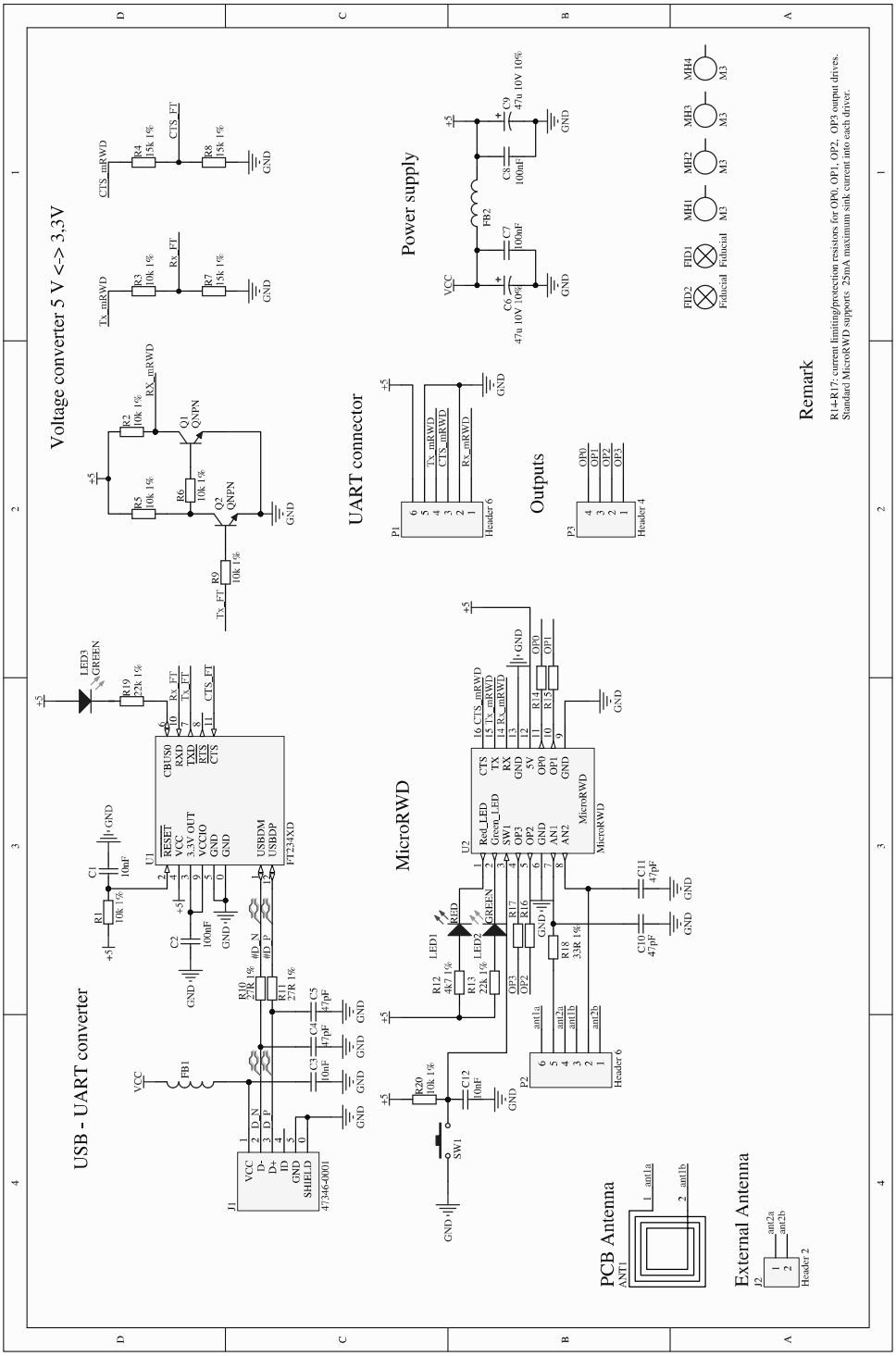
The RWD QT SMT mounted with 2x pin headers and 2x female headers.



The RWD QT SMT with soldered male pin header CONNFLY ZL201-08SG

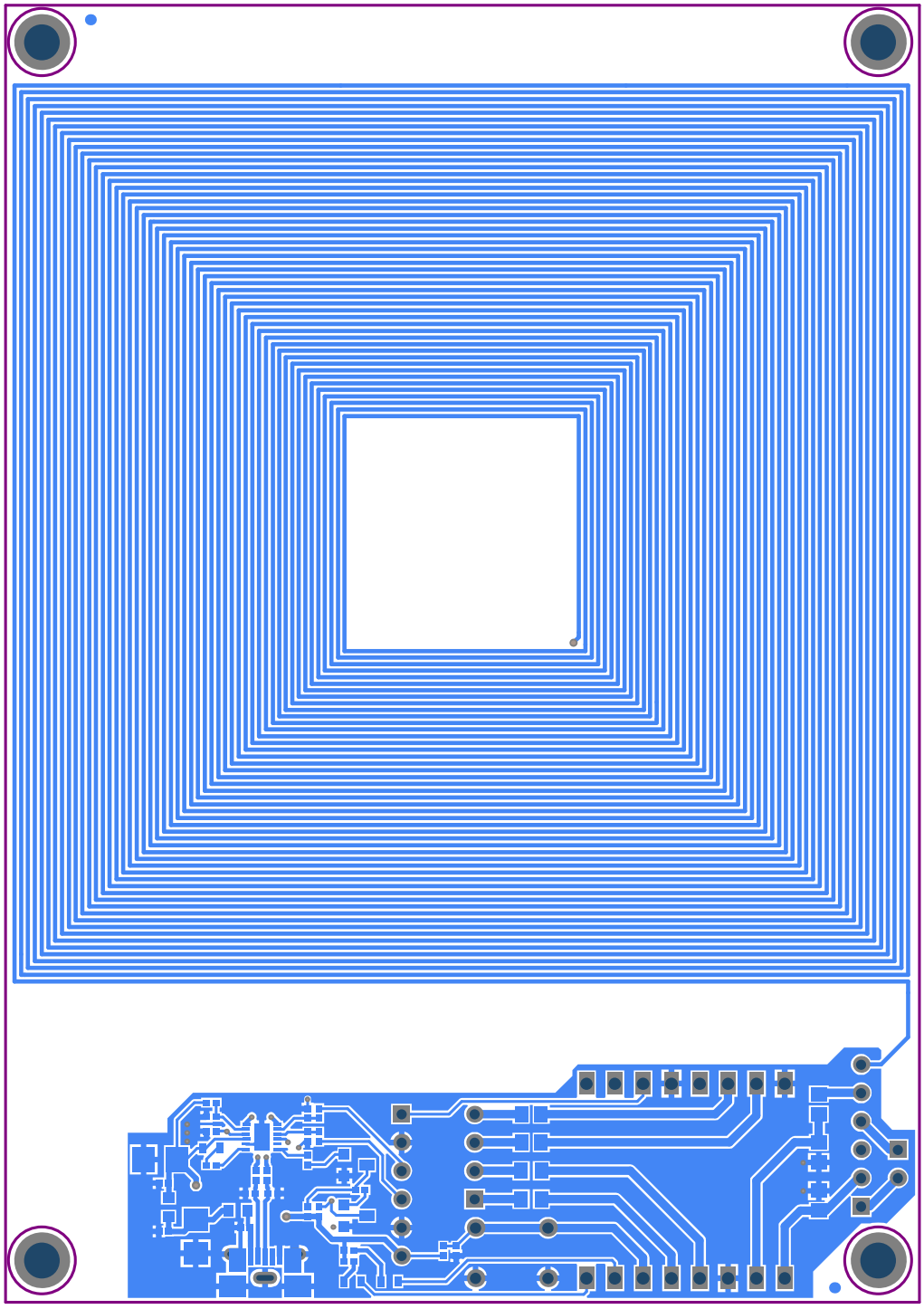
Appendix A. Schematics and Layouts

1. Schematic

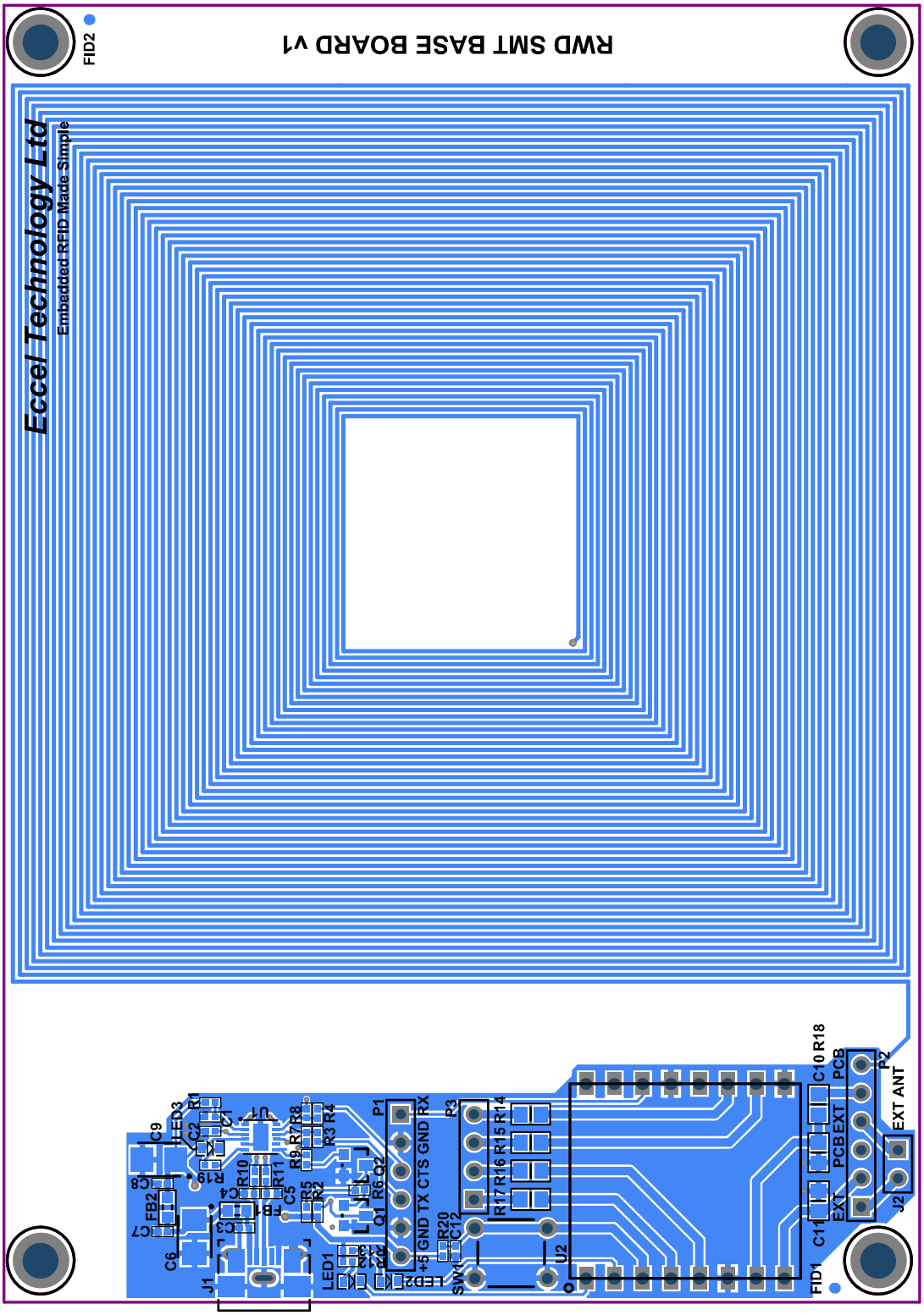


2. Top cooper

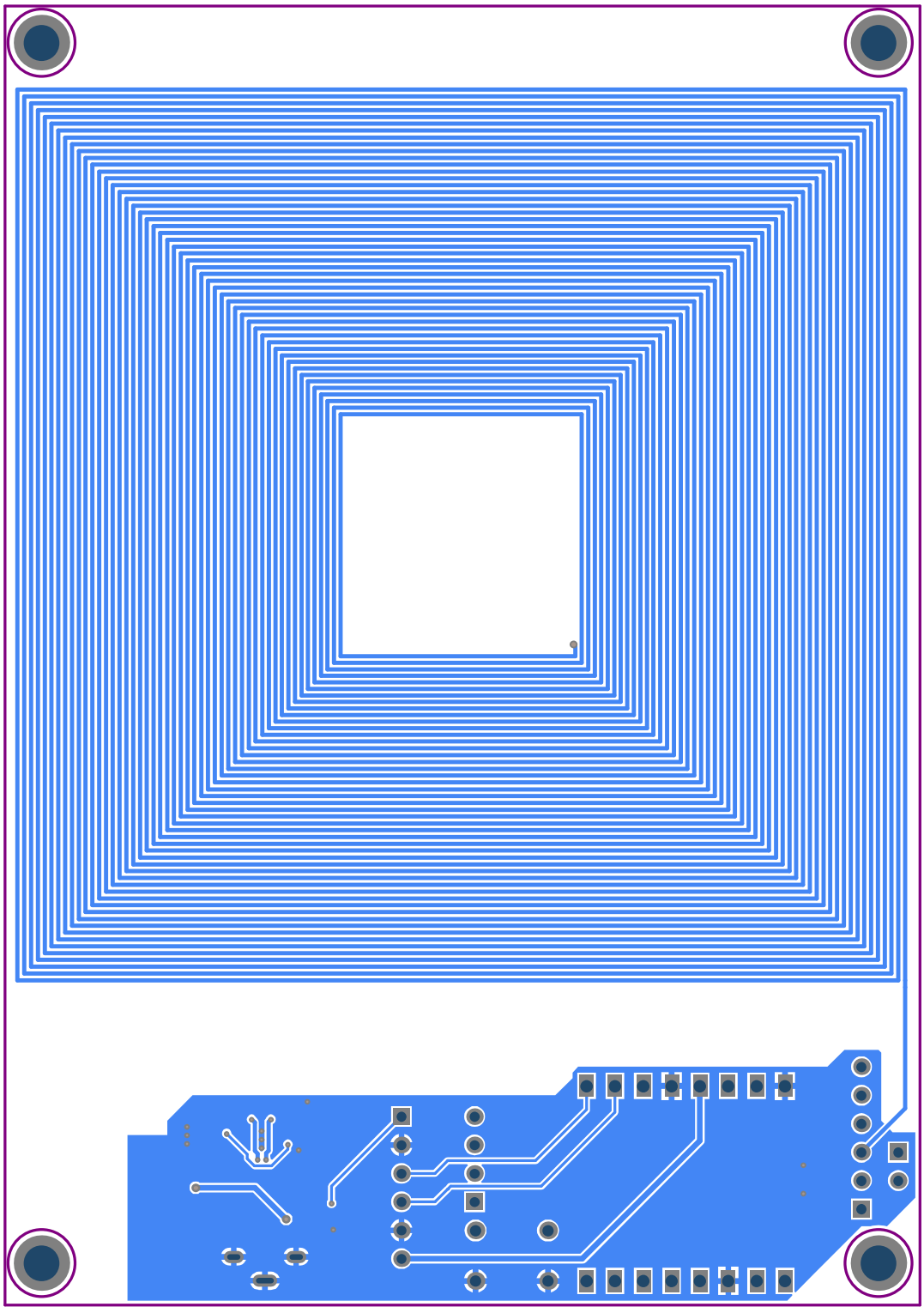
The Gerber PCB layout files for this board are available free-of-charge on request. If interested please contact us via e-mail sales@eccel.co.uk.



4. Top cooper and silk



5. Bottom cooper



Appendix B. Bill of materials (BOM)

The Universal Socket Board has been designed with thorough attention to noise suppression and filtering of the 5-volt supply (see circuit schematics above). In simple applications many of these precautions can be omitted. The Bill-of-Materials list below shows the typical parts-list with Manufacturer part-numbers, in most cases equivalent components can be used accordingly.

Quantity	Designator	Comment	Manufacturer	Manufacturer P/N
3	C1, C3, C12	Capacitor 10nF X7R 50V 10%, SMD 0402	KEMET	C0402C103K5RACTU
1	C2	Capacitor 100nF X5R 50V 10% SMD 0402	MURATA	GRM155R61H104KE19D
2	C4, C5	Capacitor 47pF C0G 50V 10% SMD 0402	KEMET	C0402C470K5GACTU
2	C6, C9	Capacitor tantalum 47u 10V 10%, Case B	KEMET	T491B476K010AT
2	C7, C8	Capacitor 100pF C0G 50V 10% SMD 0402	KEMET	C0402C101K5GACTU
2	C10, C11	Capacitor 47pF C0G 100V 10% SMD 0805	KEMET	C0805C470J1GACTU
2	FB1, FB2	Ferrite Bead 300ohm	WURTH ELEKTRONIK	742792641
1	J1	Conn. USB micro-B, Female	MOLEX	47346-0001
1	LED1	Diode LED RED, SMD 0603	OPTOSUPPLY	OSR50603C1E
2	LED2, LED3	Diode LED GREEN, SMD 0603	OPTOSUPPLY	OSG50603C1E
2	P1, P2	Conn. Header-2.54, Male, 1x6, Gold	CONNFLY	ZL201-06G
1	P3	Conn. Header-2.54, Male, 1x4, Gold	CONNFLY	ZL201-04G
2	Q1, Q2	Transistor QNPN, SOT-23	NXP	BC817-25.215
7	R1, R2, R3, R5, R6, R9, R20	Resistor 10k 1% SMD 0402	VISHAY	CRCW040210K0FKTDBC
3	R4, R7, R8	Resistor 15k 1% SMD 0402	VISHAY	CRCW040215K0FKTDBC
2	R10, R11	Resistor 27R 1% SMD 0402	VISHAY	CRCW040227R0FKTDBC
1	R12	Resistor 4k7 1% SMD 0402	VISHAY	CRCW04024K70FKTDBC
2	R13, R19	Resistor 22k 1% SMD 0402	VISHAY	CRCW040222K0FKTDBC
4	R14, R15, R16, R17	Resistor 4k7 1% SMD 0805	VISHAY	CRCW08054K70FKEA
1	R18	Resistor 33R 1% SMD 0805	VISHAY	CRCW080533R0FKEA
1	SW1	Microswitch SPST-NO, TACT-67N-F	NINGI	TACT-67N-F
1	U1	USB Interface IC FT234XD	FTDI	FT234XD
1	U2	RWD SMT	ECCEL Technology Ltd	RWD SMT QT V1

No responsibility is taken for the method of integration or final use of RWD SMT

More information on the RWD SMT and other products can be found at the Internet web site:

http://www.eccel.co.uk

or alternatively contact ECCEL Technology (IB Technology) by email at:

sales@eccel.co.uk